Application No.:

Docket No.: 057810-0088 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Customer Number: 20277
Eiji MARUYAMA	:	Confirmation Number: 2908
Application No.: 10/790,759	:	Tech Center Art Unit: 1795
Filed: March 03, 2004	:	Examiner: Golam Mowla

For: PHOTOVOLTAIC DEVICE AND DEVICE HAVING TRANSPARENT CONDUCTIVE FILM

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF (37 CFR 41.37) AND CORRECTED APPEAL BRIEF

Mail Stop Appeal Brief
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This response is submitted in response to the Notification of Non-Compliant Appeal Brief (37 CFR 41.37) mailed January 4, 2010, and in support of the Appeal Brief filed December 16, 2009, wherein Appellant appeals from the Examiner's rejection of claims 8-11, 14, 19 and 20. This response changes "claim 1" to "claim 8," in line 1 of "Summary of Claimed Subject Matter."

Real Party In Interest

This application is assigned to Sanyo Electric, CO., LTD by assignment recorded on March 03, 2004, at Reel 015042, Frame 0890.

Related Appeals and Interferences

Appellant is unaware of any related appeals and interferences.

Status of Claims

1. Claims canceled: 1-7, 12-13 and 15-18.

2. Claims pending: 8-11, 14, 19 and 20.

3. Claims rejected: 8-11, 14, 19 and 20.

4. Claims on appeal: 8-11, 14, 19 and 20.

Status of Amendments

No amendments were filed after the final rejection of July 17, 2009.

Summary of Claimed Subject Matter

An aspect of the invention, per independent claim 8, is a photovoltaic device having a transparent conductive film. The device includes a first conductivity type crystalline semiconductor substrate having a front surface and a back surface and receiving light incident from the side of said front surface, and a substantially intrinsic first amorphous semiconductor layer formed on said front surface of said crystalline semiconductor substrate (See page 14, lines 3-9 of the application-as-filed) The substantially intrinsic first amorphous semiconductor layer is of a single layer. The photovoltaic device further includes a second conductivity type second amorphous semiconductor layer formed on the first amorphous semiconductor layer, and a transparent conductive film, formed on the second amorphous semiconductor layer. (See page 14, lines 9-13 of the application-as-filed) The transparent conductive film includes an indium oxide layer (222) having plane orientation with two (222) peaks in the indium oxide layer, and a collector is formed on the transparent conductive film. The two (222) peaks include a first peak having an intensity (I1) and a second peak having an intensity (I2). The ratio

(I1/I2) of the intensity (I1) of the first peak to the intensity (I2) of the second peak is at least 0.48 and around 0.5. The indium oxide layer contains Sn, and the content of Sn with respect to In in the indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight. (See page 26, lines 6-14 of the application-as-filed)

Another aspect of the invention, per claim 19, is a photovoltaic device having a transparent conductive film. The photovoltaic device includes a first conductivity type single-crystalline silicon substrate having a front surface and a back surface and receiving light on the side of said front surface, and a substantially intrinsic first amorphous silicon layer formed on the front surface of the single-crystalline silicon substrate. The substantially intrinsic first amorphous silicon layer is of a single layer. (See page 14, lines 3-9 of the application-as-filed) The device further includes a second conductivity type second amorphous silicon layer formed on the first amorphous silicon layer, and a transparent conductive film, formed on said second amorphous silicon layer. (See page 14, lines 9-13 of the application-as-filed) The transparent conductive film includes an indium oxide layer having (222) plane orientation with two (222) peaks in the indium oxide layer, wherein the two (222) peaks include a first peak having an intensity (I1) and a second peak having an intensity (I2). The ratio (I1/I2) of the intensity (I1) of the first peak to the intensity (I2) of the second peak is at least 0.48 and around 0.5. The indium oxide layer contains Sn. The content of Sn with respect to In in the indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight. A collector is formed on the transparent conductive film. (See page 26, lines 6-14 of the application-as-filed)

Grounds of Rejection To Be Reviewed By Appeal

1. Claims 8-11, 14 and 19-20 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

2. Claims 8-11, 14 and 19-20 were rejected under 35 U.S.C. § 103 as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Neerinck et al. ("Depth profiling of thin ITO films by grazing incidence X-ray diffraction," Thin Solid Films 278 (1996) pp12-17, hereinafter "Neerinck") and Adurodija et al. ("Effect of Sn doping on the electronic transport mechanism of indium-tin-oxide films grown by pulsed laser deposition coupled with substrate irradiation" - J. Appl. Phys. 88 (2000) pp 4175-4180, hereinafter "Adurodija").

Argument

1. Rejection Under35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement.

Claims 8-11, 14 and 19-20

Examiner's Position:

The Examiner asserted that the limitations of claims 8 and 19 regarding "said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is around 0.5 **excluding 0.46**" is not supported by the original disclosure as filed, and the original disclosure allegedly does not provide any support as to whether the intensity ratio is "at least 0.48."

Appellant's Position:

Contrary to the Examiner's assertion, the limitations of claims 8 and 19, "said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 around 0.5," has sufficient support. As illustrated in FIG. 6 of the application-as-filed, the cell output (Pmax), which is represented by a square mark "□," varies according to change of the peak intensity ratio (I1/I2), which is the ratio of the intensity (I1) of the first peak to the intensity (I2)of the second

peak. The cell output (Pmax) has a maximum value when the peak intensity ratio (I1/I2) is at least 0.48 and around 0.5. (See page 26, lines 6-14 of the application-as-filed)

2. Rejection Under 35 U.S.C. § 103(a) as being unpatentable over AAPA, Neerinck and Adurodija.

Claims 8-11, 14 and 19-20

Examiner's Position:

The Examiner acknowledged that AAPA does not disclose "an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5." The Examiner contended that Neerinck allegedly discloses "an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5."

Appellant's Position:

Neerinck, however, fails to disclose "the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5." Neerinck purports to show how intensity of the peak of the ITO film changes as the incidental angle ω changes. As disclosed in FIG. 2, the ITO film may have one peak or two peaks depending on the value of the incidental angle ω. Neerinck shows only one case when the ITO film has two peaks (see FIG. 1). When the ITO film has

two peaks, the intensity of the first peak is 2.5 and the intensity of the second peak is 5.5, so the intensity ratio of the first peak to the second peak is 2.5/5.5=0.4545, as the Examiner asserted. Neerinck's intensity ratio of the two peaks (0.4545) does not fall within the range of the intensity ratio as required by claim 8, that is "at least 0.48 and 0.5."

The Examiner further maintained that, since the peak intensity (I1 or I2) increases with increase of the incidental angle ω, the intensity ratio (I1/I2) can be easily varied in the range as required by claim 8. What is controlled by changing the value of the incidental angle ω is not the relative intensity ratio of the first peak intensity (I1) to the second peak intensity (I2), but the number of peaks. As disclosed in Neerinck's FIGS. 1-2, change of the incidental angle neither controls the values of the peak intensity, nor intensity ratio between the first peak and the second peak when the two peaks exist. Thus, the Examiner's assertion that the intensity ratio of two peaks can be optimized by controlling value of the incidental angle ω is without any ground.

In contrast, as disclosed in FIG. 6 of the application-as-filed, the intensity ratio (I1/I2) of the first peak to the second peak influences the generation of the cell output of the photovoltaic device. Thus, the cell output Pmax can be controlled by changing the intensity ratio (I1/I2), and the photovoltaic devices generates the maximum cell output Pmax approximately at the intensity ratio (I1/I2) of at least 0.48 and around 0.5.

In rejecting a claim under 35 U.S.C. § 103, the Examiner is required to discharge the initial burden by, *inter alia*, making **"clear and particular"** factual findings as to a **specific understanding** or **specific technological principle** which would have **realistically** impelled one having ordinary skill in the art to modify an applied reference to arrive at the claimed invention based upon facts, -- not generalizations. *Ruiz v. A.B. Chance Co.*, 234 F.3d 654, 57 USPQ2d 1161 (Fed. Cir. 2000); *Ecolochem Inc. v. Southern California Edison, Co.*, 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000);

In re Kotzab, *supra*; *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999). That burden has not been discharged, as the Examiner has provided no factual basis for modifying Neerinck's disclosure to provide "an indium oxide layer having (222) plane orientation with two (222) peaks, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is **at least 0.48 and around 0.5**."

Thus, since Adurodija fails to cure deficiencies of Neerinck and AAPA, the combination of AAPA, Neerinck and Adurodija fails to teach "an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5," as required by claim 8. Therefore, claim 8 is patentable over the combination of AAPA, Neerinck and Adurodija.

The dependent claims are allowable for at least the same reasons as the independent claims from which they depend and further distinguish the claimed apparatus and method.

Conclusion

Based upon the arguments submitted supra, Appellant respectfully submits that the Examiner's rejections under 35 U.S.C. §§ 103 and 112 are not legally viable. Appellant, therefore, respectfully solicits the Honorable Board to reverse the Examiner's rejection of claims 8-11, 14, and 19-20 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement; and claims 8-11, 14, and 19-20 as being unpatentable as evidenced by AAPA, Neerinck and Adurodija.

For all of the foregoing reason, Appellant respectfully submits that the grounds of rejection of the claims on appeal is in error and should be reversed.

Respectfully submitted,

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CLAIMS APPENDIX

8. A photovoltaic device comprising:

a first conductivity type crystalline semiconductor substrate having a front surface and a back surface and receiving light incident from the side of said front surface;

a substantially intrinsic first amorphous semiconductor layer formed on said front surface of said crystalline semiconductor substrate, the substantially intrinsic first amorphous semiconductor layer consisting of a single layer;

a second conductivity type second amorphous semiconductor layer formed on said first amorphous semiconductor layer; and

a transparent conductive film, formed on said second amorphous semiconductor layer, including an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5,

wherein said indium oxide layer contains Sn, and the content of Sn with respect to In in said indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight,

wherein a collector is formed on the transparent conductive film.

9. The photovoltaic device according to claim 8, wherein

said (222) peaks in said indium oxide layer include:

a first peak having an angle 2θ (θ: X-ray diffraction angle) of about 30.1 ± 0.1 degrees, and

a second peak having an angle 2θ (θ: X-ray diffraction angle) of about 30.6 ± 0.1 degrees.

10. The photovoltaic device according to claim 9, wherein

the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least about 0.07 and not more than about 0.9.

11. The photovoltaic device according to claim 10, wherein

the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least about 0.25 and not more than about 0.75.

14. The photovoltaic device according to claim 8, wherein

said crystalline semiconductor substrate is an n-type semiconductor substrate, and said second amorphous semiconductor layer is a p-type semiconductor layer.

19. A photovoltaic device comprising:

a first conductivity type single-crystalline silicon substrate having a front surface and a back surface and receiving light on the side of said front surface;

a substantially intrinsic first amorphous silicon layer formed on said front surface of said single-crystalline silicon substrate, the substantially intrinsic first amorphous silicon layer consisting of a single layer;

a second conductivity type second amorphous silicon layer formed on said first amorphous silicon layer; and

a transparent conductive film, formed on said second amorphous silicon layer, including an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an

intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5,

wherein said indium oxide layer contains Sn, and the content of Sn with respect to In in said indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight,

wherein a collector is formed on the transparent conductive film.

20. The photovoltaic device according to claim 19, wherein

said (222) peaks in said indium oxide layer include:

a first peak having an angle 2θ (θ: X-ray diffraction angle) of about 30.1 ± 0.1 degrees, and

a second peak having an angle 2θ (θ: X-ray diffraction angle) of about 30.6 ± 0.1 degrees.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.